Performance evaluation of multiplex-PCR pneumonia panel for diagnosis of bacterial co-infections among COVID-19 patients

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Bacterial pneumonia in COVID-19 critically ill patients

- Bacterial co/super-infections were reported to be common among patients with severe form of COVID-19
- An estimated 50% - 70% of COVID-19 patients are treated empirically with antibiotics[1,2], despite the fact that COVID-19 is caused by a virus
- Rapid detection of the bacterial etiology causing pneumonia among these patients can be helpful in early initiation of targeted antimicrobial therapy
- We aimed to investigate the performance and utility of Unyvero Hospitalized Pneumonia (HPN) Panel, a multiplex PCR cartridge-based sample-to-answer method for rapid detection of bacterial pathogens from lower respiratory tract samples obtained from a cohort of critically ill COVID-19 patients

[1] Fajgenbaum et al. Infect Dis Ther. 2020 May 27;1-15
[2] Langford at al. Clin Microbiol Infect. 2020 Jul 22;S1198-743X(20)30423-7

Concordance between Unyvero HPN Panel and SoC results by organism

Etiologic samples (N=83)	Concordance	Missed by Culture	Missed by HPN
Gram Positive Bacteria			
Staphylococcus aureus	23	8	0
Streptococcus pneumoniae	1	0	0
Gram Negative Bacteria			
Escherichia coli	6	0	0
Klebsiella pneumoniae	3	0	0
Klebsiella oxytoca	4	2	1
Klebsiella variicola	1	0	0
Klebsiella aerogenes	4	1	2
Citrobacter freundii	1	1	0
***Proteus* species**	1	0	0
***Enterobacter cloacae* complex**	0	0	0
Morganella morganii	0	0	0
Serratia marcescens	4	4	0
Haemophilus influenzae	4	2	0
Moraxella catarrhalis	0	0	0
***Acinetobacter baumannii* complex**	1	0	0
Pseudomonas aeruginosa	5	4	0
Stenotrophomonas maltophilia	1	1	0
Total number of Organisms	**59**	**23**	**3**

- We tested 83 samples consisting of 61 (73.5%) tracheal secretions, 11 (13.4%) BAL, 8 (9.7%) protected specimen brush (PSB), 2 (2.4%) bronchial secretions, and 1 (1.2%) sputum sample.
- Eighty-three samples were obtained from 68 subjects (one-sample each from 57 unique subjects, two samples each from 7 subjects, and three samples each from 4 subjects).
- 74% of the study subjects were male and 26% were female; mean age was 58.8 years old.

No. (%) of HPN panel organism isolated from each sample compared to SoC

		SoC				
		None	One	Two	Three	Total
HPN panel	None	**26 (83.8)**	1 (1.2)	0	0	27
	One	6 (19.2)	**25 (67.5)**	1 (1.2)	0	32
	Two	1 (3.8)	10 (24.3)	**8 (53)**	0	19
	Three	0	0	3 (17.6)	**0**	3
	Total	33	36	17	0	81*

*2 out of 83 samples were excluded (one sample SoC=*K. aerogenes* and HPN=*S. aureus*, one sample SoC=*C.koseri* and HPN=*C. freundii*)

Concluding remarks

- Turnaround time for final culture result was 68 hours, during which patients continue to receive empiric antibiotics. Unyvero HPN panel reduces diagnostic turnaround times from days to less than 5 hours.
- HPN panel has great negative percent agreement with bacterial culture; therefore, high clinical utility as rapid “rule out”.
- SoC missed 23 pathogens that were detected by HPN; only 3 pathogens (NPV 99.8%) were reported by SoC that were undetected by the HPN panel.
- HPN enables Point of Care diagnosis of LRTIs, useful adjunct to the SoC testing.
- Rapid and accurate detection is essential to assess bacterial pneumonia co-infection in COVID-19 critically ill patients. Unyvero HPN is a useful diagnostic tool to help with early detection and antimicrobial stewardship.
- In settings with high burden of AMR, the method can be extremely beneficial for escalation/ de-escalation of antibiotics.